CLAIMS

What is claimed is:

1. A method of MR imaging comprising the steps of:

determining a desired RF excitation profile; and

independently driving each transmit coil of a transmit coil array such that a collective excitation generated by the transmit coil array substantially matches the desired RF excitation profile.

2. The method of claim 1 wherein the step of independently driving includes the step of separately controlling current generated in each transmit coil by a respective RF amplifier connected thereto.

3. The method of claim 2 wherein the step of separately controlling includes the step of providing a control signal to each RF amplifier, each control signal representing an RF pulse waveform specific to a corresponding transmit coil.

4. The method of claim 3 further comprising the step of determining the RF pulse waveform for each transmit coil from a spatially weighted version of the desired RF excitation profile.

5. The method of claim 4 further comprising the step of determining a spatial weighting for each transmit coil that takes into account at least mutual coupling between the transmit coils.

6. The method of claim 5 wherein the spatial weighting for each transmit coil further takes into account spatial frequency sampling induced by the pulsing gradient field and spatial weightings induced by each coil's B_1 field.

7. An MRI apparatus comprising:

a magnetic resonance imaging (MRI) system having a magnet to impress a polarizing magnetic field, a plurality of gradient coils positioned about the bore of the magnet to impose a magnetic field gradient, and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images; and

a computer programmed to apply a plurality of RF pulse waveforms configured to control RF generation by a transmit coil array such that a result of collective RF generation across an imaging volume substantially matches a desired RF excitation profile.

8. The MRI apparatus of claim 7 wherein the computer is further programmed to determine an effective spatial weighting imposed on the collective RF generation by each transmit coil of the transmit coil array and design the plurality of RF pulse waveforms such that coupling-induced inter-coil correlations are taken into account.

9. The MRI apparatus of claim 8 wherein the effective spatial weighting imposed by each transmit coil includes at least spatial-frequency weightings induced by independently controlled RF sources connected to the transmit coil array, weighting associated with mutual coupling between the transmit coils of the transmit coil array, and a respective B_1 field.

10. The MRI apparatus of claim 7 wherein the plurality of RF pulse waveforms are further configured to effect shorter time-span execution k-space traversing by reducing excitation k-space sampling density.

11. The MRI apparatus of claim 7 wherein the computer is further programmed to control RF generation such that the result of collective RF generation

substantially matches the desired excitation profile independent of transmit coil array geometry.

12. The MRI apparatus of claim 7 wherein the computer is further programmed to determine an effective B_1 field for each transmit coil during calibration of the MRI system.

13. The MRI apparatus of claim 7 wherein the transmit coil array is linearly arranged and further configured to receive MR signals.

14. The MRI apparatus of claim 7 wherein the transmit coil array is further configured to induce RF field based on driving parallel excitation pulses.

15. The MRI apparatus of claim 7 wherein the plurality of waveform are further configured to reduce aliasing side lobes in the collective RF generation across the imaging volume.

16. The MRI apparatus of claim 7 wherein the computer is further programmed to design the plurality of RF pulse waveforms to be applied to the transmit coil array.

17. A computer readable storage medium having a computer program stored thereon and representing a set of instructions that when executed by a computer causes the computer to control RF transmission by a plurality of transmit coils of a transmit coil array such that spatial and temporal variation in a composite B_1 field induces a desired excitation profile upon completion of RF transmission.

18. The computer readable storage medium of claim 17 wherein the set of instructions further causes the computer to control application of gradients in an imaging

volume to be in synchrony with spatial and temporal variation creation in the RF transmissions.

19. The computer readable storage medium of claim 17 wherein the set of instructions further causes the computer to control application of control signals to the plurality of transmit coils such that RF excitation by the plurality of transmit coils occur in parallel.

20. The computer readable storage medium of claim 17 wherein the set of instructions further causes the computer to determine the spatial and temporal variations to be induced with at least one transmit coil's effective B_1 field map.

21. The computer readable storage medium of claim 20 wherein the effective B_1 field maps at least reflect mutual coupling of the plurality of transmit coils.

22. The computer readable storage medium of claim 17 wherein the effective B_1 field maps are generated during calibration of the transmit coil array.

23. The computer readable storage medium of claim 17 wherein the set of instructions further causes the computer to determine control signals to be applied to the plurality of transmit coils based on at least a Fourier transform of a spatially weighted version of the desired excitation profile.

24. The computer readable storage medium of claim 17 wherein the set of instructions further causes the computer to control RF transmission such that the composite B_1 field is created three-dimensionally about the imaging volume.